

Portfolio Safeguard: Risk Management/Optimization Breakthrough Technology

American Optimal Decisions (AOrDa) software product

Portfolio Safeguard (PSG) is an advanced decision-support tool for portfolio analysts, traders, and managers. PSG addresses a wide range of financial analyses problems, such as portfolio optimization, asset allocation, selection of insurances, hedging with derivative contracts, bond matching, and structuring of Collateralized Debt Obligations (CDOs).

Nowadays portfolio analysis and trading strategies are becoming increasingly computerized and complicated. Sophisticated statistical characteristics, such as Value-at-Risk and Drawdown need to be measured and controlled on daily basis. Statistics and optimization algorithms became an essential engine of the modern financial analysis. It seems to make numerical portfolio optimization and analysis you need to know advance math, statistics, and C++. Not anymore!

PSG is a result of 15 years of experience in development of trading strategies and risk management. It is a **“dream” tool for quantitative analysis and decision making with a variety of risk measures estimating portfolio performance, efficient numerical algorithms making fast and robust decisions, and a powerful convenient graphical interface. NO formal math-statistics-optimization-programming background is required.** You build a portfolio optimization problem with a drag and drop menu; PSG solves and analyses it in a matter of seconds.

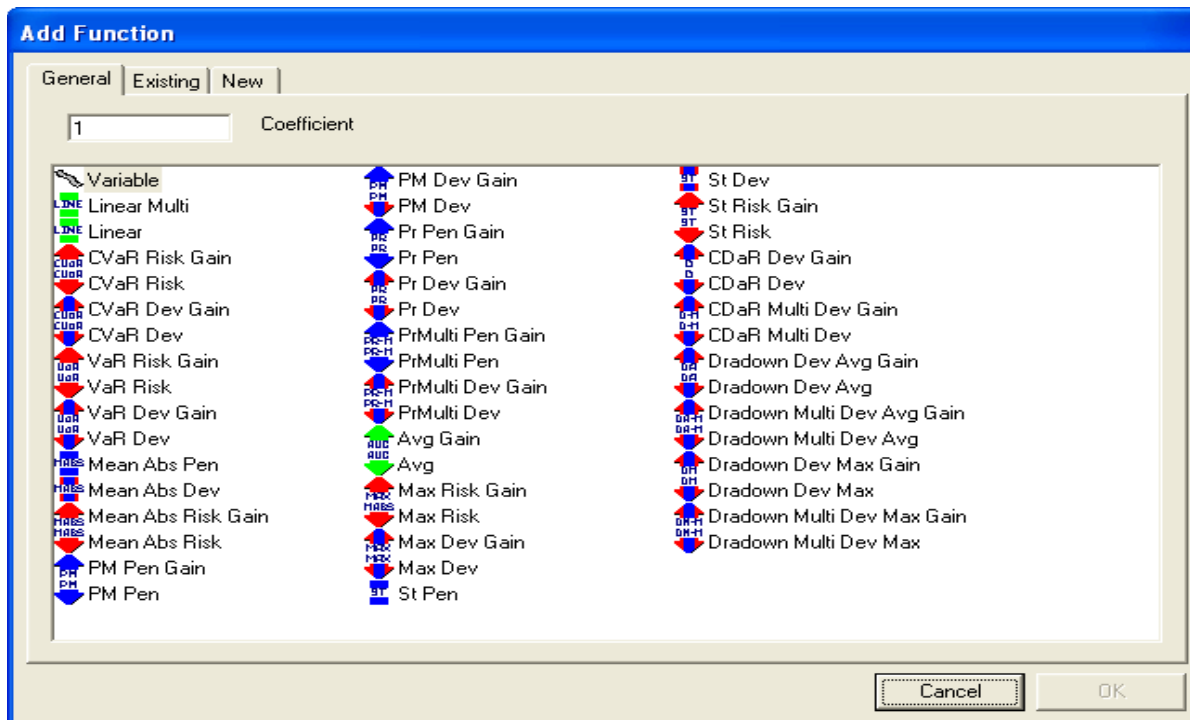
Meeting Diverse Needs

- adequate accounting for risks: downside risk measures, such as Value-at-Risk (VaR), Conditional Value-at-Risk (CVaR), Drawdown, maximum loss, lower partial moment, probability of underperforming a benchmark and others
- robust decisions: simultaneous constraints on various risks and criterias obtained with several models at various time intervals (e.g., multiple constraints on standard deviations obtained by resampling in combination with drawdown constraints)
- functional flexibility: optimization and analysis of problems are formed by a user-friendly constructor (pulling from menu various risk functions). By a click of mouse you can replace, for instance, standard deviation by drawdown in a portfolio optimization problem
- data flexible system: problem can be formulated and tested with a small dataset, the optimization problem and sensitivity analysis is automatically reconstructed by just pointing to some other dataset with a different set of instruments and scenarios
- scenarios-based data management: input data to PSG are historical observations of returns/prices of instruments or scenarios from Monte-Carlo based risks measurement packages, such as RiskMetrics or S&P CDO evaluator
- fast and robust optimization and efficient sensitivity algorithms specialized for downside risks (such as Rockafellar-Uryasev reduction of CVaR to linear programming)
- export/import of data and graphs to/from text and Windows Excel files; possibility to interface with databases by adding user friendly converters of data

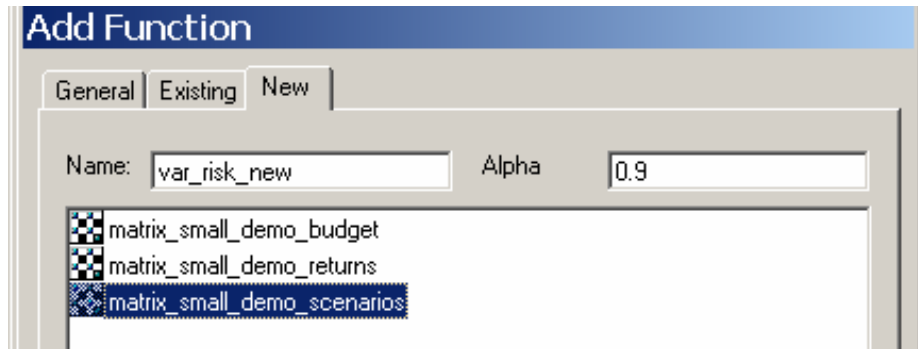
Why Portfolio Safeguard?

Simple and user-friendly interface. PSG supports “LEGO” type construction of problems in standard directory/subdirectory format. PSG features analytical input of risk functions, constraints and scenario datasets. A problem is constructed by mouse pooling of functions to objective and constraints. Optimization and analysis is done with various risk functions (similar to Markowitz portfolio optimization with variance and expectation).

Variety of risk functions. PSG addresses a wide range of optimization problems in financial engineering and risk management. A comprehensive set of risk functions includes Standard Deviation, Mean Absolute Deviation, VaR, CVaR, Partial Moment, Drawdown, Omega, Probability, and others. Pick by mouse from the list:



Function builder. Create a new risk function by picking it from the list and pointing to a dataset.



Objective/Constraint builder for optimization/analysis. Objectives and constraints are linear combinations of various risk functions (drag and drop by mouse).

The 'Constraints' tree view shows two constraint nodes. The first node, 'constraint_capital_covering_credit_risk', contains a 'LINE' function 'linear_capital_covering_credit_risk' and two variables: 'variable_x1a' and 'variable_x2a'. The second node, 'constraint_capital_covering_market_risk', contains a 'LINE' function 'linear_Specific_Market_Risk', three variables: 'variable_x1a', 'variable_x2a', and 'variable_x3a', and a 'UoB' function 'var_dev_trading_book'.

Coefficients	Functions
-Infinity	<
1	LINE linear_Specific_Market_Risk
1	variable_x1a
1	variable_x2a
-1	variable_x3a
3	UoB var_dev_trading_book
10	<

Optimization problem builder. Objectives and constraints are pooled to an optimization problem by simple operations (drag and drop by mouse).

The screenshot shows the Portfolio Safeguard software interface. The main window title is "Portfolio Safeguard". The menu bar includes "Operations", "View", "Problem", "Objective", "Constraint", "Function", "Variables_Box", and "Help". The toolbar contains icons for "File", "Data", "Functions", "Problems", "Optimization", "Analyses", and "Graphs".

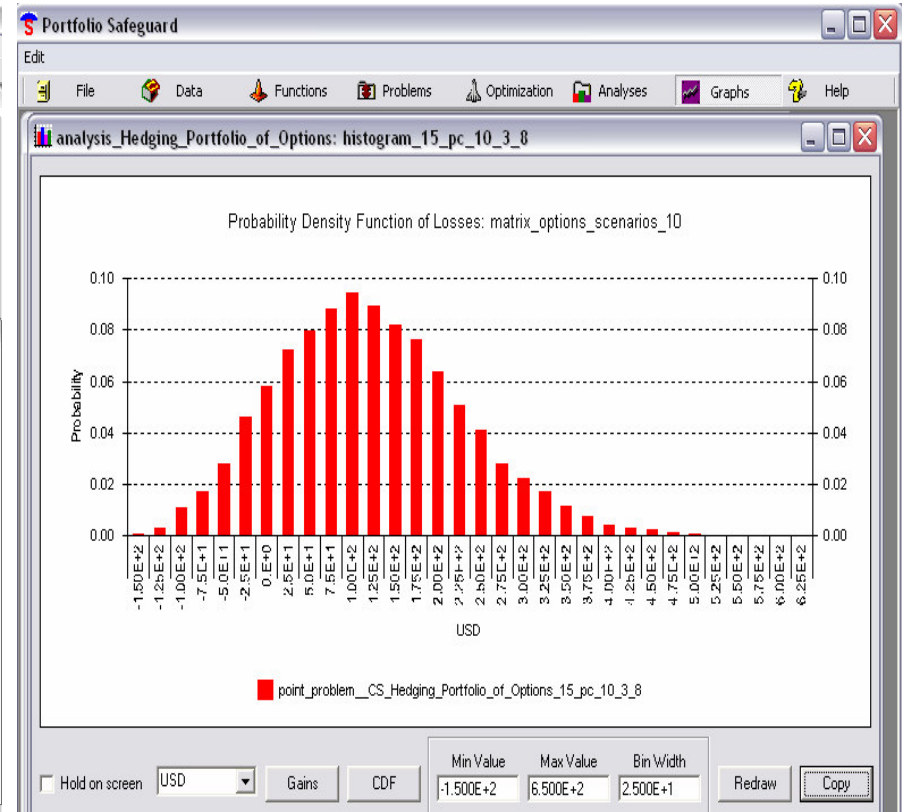
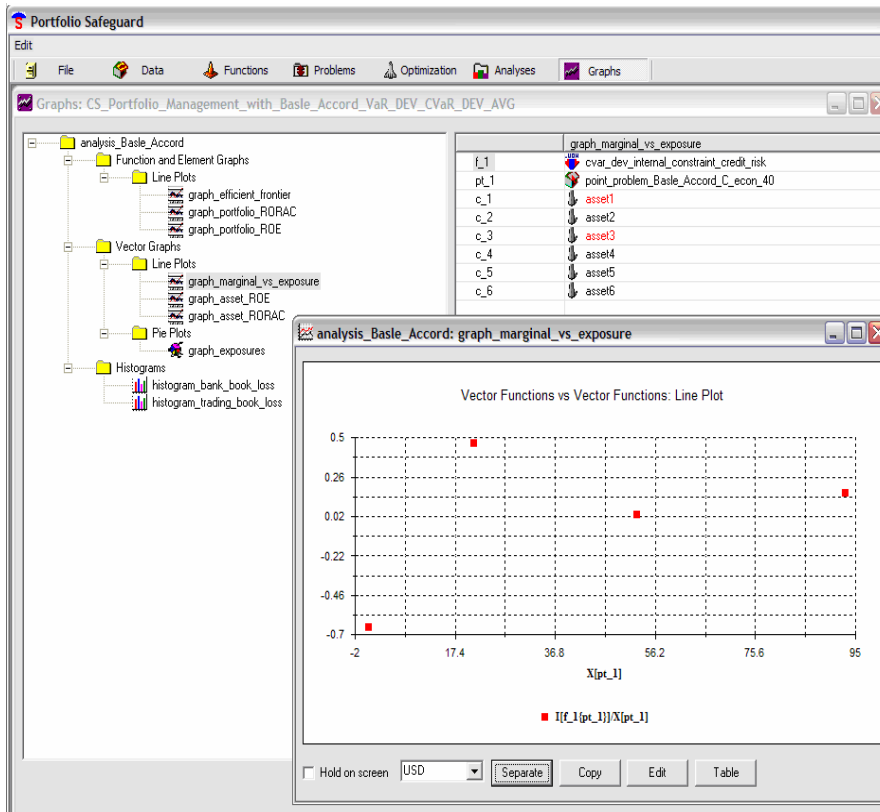
The main workspace is titled "Problems: CS_Portfolio_Management_with_Basle_Accord_VaR_DEV_CVaR_DEV_AVG". It is divided into two panes:

- Left Pane (Tree View):** Shows a hierarchical structure of the optimization problem. The root node is "problem_Basle_Accord_C_econ_65". It contains:
 - Objective:** "objective_Basle_Accord_return"
 - Constraints:** "constraint_internal_credit_risk", "constraint_capital_covering_credit_risk", "constraint_capital_covering_market_risk" (highlighted), "constraint_Tier1_Tier2_Tier3", and "constraint_Tier1_Tier2".
 - Box of Variables:** A separate section for variables.
- Right Pane (Table View):** Displays the details for the selected constraint, "constraint_capital_covering_market_risk".

Coefficient	Function
1	linear_Specific_Market_Risk
1	variable_x1 a
1	variable_x2a
-1	variable_x3a
3	var_dev_trading_book
Matrices	
	matrix_specific_market_risk_weights
	matrix_trading_book_scenarios
Variables	
	asset1
	asset2
	asset3
	asset4
	asset5
	asset6
	x1 a
	x2a
	x3a

Solution analysis tools

PSG offers several tools for analyzing solutions, generated by optimization or through other procedures. Among these tools are calculation of sensitivities of risk measures to changes in decision variables, and incremental impact of decision variables on risk measures and various functions of risk measures. Analysis can reveal exposures having the biggest impact on risk and other functions, such as expected portfolio return. For visualization of these and other characteristics, PSG provides powerful tools for building and plotting various characteristics combining different functions, points, and variables.



Fast modification of problems

Generated problem may be easily reconstructed by a simple manipulation of elements of problems, functions, and data. For instance, uploading a new dataset (possibly with a new set of variables) regenerates the optimization problem and analysis without any additional work. You can include/exclude various constraints with a click of mouse.

Complicated problems and powerful algorithms

PSG incorporates efficient and robust optimization methods for solving a wide spectrum of optimization problems including problems that can not be solved by other commercial packages, such as non-convex optimization with probability functions, VaR, Omega and others.

Extensive set of documented solved problems and case studies

You can start problem building with an existing case study and modify/adjust it to you needs with powerful dialogue tolls. Here is a selection from the list of documented case studies (relevant risk functions are in parentheses):

- Portfolio management with Basel accord (VaR Deviation, CVaR Deviation)
- Omega portfolio rebalancing (Omega, Partial Moment)
- Cash matching bond problem (Maximum Deviation)
- Basic CVaR optimization problem, beyond Black-Litterman (CVaR)
- Optimization retail portfolio of bonds (VaR Deviation)
- Optimal crop production and insurance coverage (Probability Exceeding Penalty, VaR, CVaR)
- Portfolio optimization: CVaR vs. Standard Deviation (CVaR, Standard Deviation)
- Portfolio optimization with Drawdown constraints, single and multiple paths (CDaR Deviation, Drawdown Deviation, CDaR Multiple Deviation, Drawdown Multiple Deviation)
- Hedging portfolio of options by options (CVaR)
- Structuring Collateralized Obligations: step-up CDOs (Probability Exceeding, Multiple Probability Exceeding)
- Portfolio optimization with transaction costs (CVaR)
- Analysis of portfolio diversification with various diversification constraints (Standard Deviation, CVaR Deviation)
- Portfolio style analysis with quantile regression (Partial Moment)
- Portfolio replication with risk constraint (Mean Absolute Deviation, CVaR)